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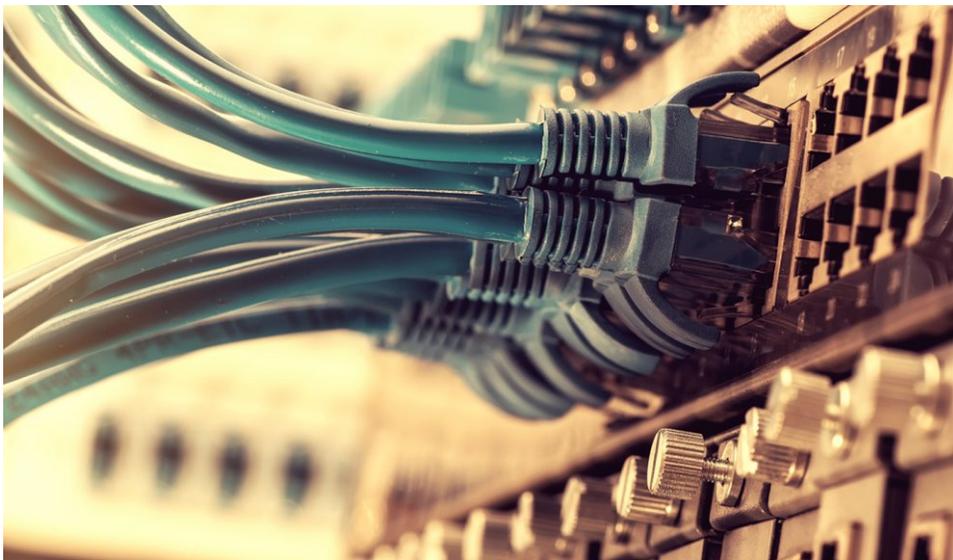
Extended Ethernet: Maintaining Network Integrity

One important feature for a copper extension product could be to maintain the network integrity.

This ensures that the network speed (wire speed) of the link is maintained at either 100Mbps or 10Mbs and that the connection is fully symmetrical. By doing this it is possible to integrate units into an Ethernet network with complete confidence that the links in no way degrades the performance of the network as they operate at the chosen wire speed. It should also be added at this stage that the line speed selected does not have to be the data rate your traffic must pass at but rather the maximum data rate that the transmission path will support.

The ComNet CopperLine range operates in this very way and supports extended distance

transmission over either coaxial or twisted pair cable, with the coaxial medium specified at RG59 or better and the twisted pair CAT5 or better. At 100Mbps distances extend to over six hundred meters on the minimum grade cable and if data rates are set to 10Mbps distances can be up to fifteen hundred meters on RG59 coaxial cable. The coaxial cable solution provides a simple migration path for analogue end users with legacy coaxial installations who can run their new IP systems over the existing installed infrastructure. It is fundamental to the successful operation of the system that the cable parameters and quality meets or exceeds the type stipulated by ComNet. CAT5 cable must meet the ANSI/TIA/EIA-568 standard and RG59 coaxial should be of a quality construction. Standards in coaxial cable can be many and varied and care should always be taken when looking to operate across it. Along with the data CopperLine also provides support for PoE at either the 15.4W (IEEE802.3af) or the 30W (IEEE802.3at) power levels1.

Unfortunately passing power through copper cables is governed by the laws of physics2 and there is an inverse relationship between the distance and the power level that can be maintained across the link. At the 15.4W level CopperLine operates in a pass-through mode, where the devices outside of the CopperLine units (in the example below an Ethernet switch and IP camera) function as the PSE (Power Sourcing Equipment) and PD (Powered Device) respectively. CopperLine units can either be externally powered or via

the PSE.

These powering options provide total flexibility, by offering the simplest installation with everything powered from the central PoE switch or the ability to deliver maximum power levels to the camera by externally powering the CopperLine devices. The ability to provide the correct power levels at the PD will be dictated by the type and quality of the cable being used and also the voltage level present at the PSE. When it comes to Ethernet switches that can operate as PSE devices the ability to increase the voltage level at the Ethernet port could be very useful. If the voltage levels can be increased, then there can be voltage drop in the cable but the voltage at the PD location could still be enough to power the connected device. In the case of IEEE802.3af the required minimum voltage at the PD is 37Vdc and the maximum voltage allowed at the PSE is 57Vdc.

If the switch is one with a mains power input then it will tend not to have that ability and the level will be set at 48Vdc but if ComNet switches with dc input are used and the power supply can be increased on some models up to 57Vdc then the switch in turn will provide those levels. When the PD requires IEEE802.3at 25.5W power levels and a minimum voltage of 42.5Vdc then the game changes significantly. The ability to deliver 25.5W at 42.5Vdc from a central PSE offering 48Vdc at distances above 100m is impossible and so

the design rational must change to that of the lower af levels. To accommodate this CopperLine PoE+ devices operate as PSE and PD devices through the link to negotiate with the Ethernet switch and camera respectively in the example shown.

By configuring in this way, either of the CopperLine devices can be used as a power injector with voltage levels up to 57Vdc allowable at the device. For example, if the local (switch end) CopperLine unit was powered with 57Vdc it would supply passive PoE to the remote CopperLine device that would then fully negotiate with the connected PD to supply power.

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